



Quinoa biodiversity and sustainability for food security under climate change. A review

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Abstract:

Climate change is rapidly degrading the conditions of crop production. For instance, increasing salinization and aridity is forecasted to increase in most parts of the world. As a consequence, new stress-tolerant species and genotypes must be identified and used for future agriculture. Stress-tolerant species exist but are actually underutilized and neglected. Many stress-tolerant species are indeed traditional crops that are only cultivated by farmers at a local scale. Those species have a high biodiversity value. Besides, the human population will probably reach nine billion within coming decades. To keep pace with population growth, food production must increase dramatically despite the limited availability of cultivable land and water. Here, we review the benefits of quinoa, *Chenopodium quinoa* Willd., a seed crop that has endured the harsh bioclimatic conditions of the andes since ancient times. Although the crop is still mainly produced in Bolivia and Peru, agronomic trials and cultivation are spreading to many other countries. Quinoa maintains productivity on rather poor soils and under conditions of water shortage and high salinity. Moreover, quinoa seeds are an exceptionally nutritious food source, owing to their high protein content with all essential amino acids, lack of gluten, and high content of several minerals, e.g., Ca, Mg, Fe, and health-promoting compounds such as flavonoids. Quinoa has a vast genetic diversity resulting from its fragmented and localized production over the centuries in the andean region, from Ecuador to southern Chile, and from sea level to the altiplano. Quinoa can be adapted to diverse agroecological conditions worldwide. Year 2013 has therefore been declared the International Year of Quinoa by the United Nations Food and Agriculture Organization. Here, we review the main characteristics of quinoa, its origin and genetic diversity, its exceptional tolerance to drought and salinity, its nutritional properties, the reasons why this crop can offer several ecosystem services, and the role of andean farmers in preserving its agrobiodiversity. Finally, we propose a schematic model integrating the fundamental factors that should determine the future utilization of quinoa, in terms of food security, biodiversity conservation, and cultural identity.

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Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Security

Climate Change and Human Health Literature Portal

Food/Water Security: Agricultural Productivity

Geographic Feature: ☐

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☐

resource focuses on specific location

Global or Unspecified

Health Impact: ☐

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Resource Type: ☐

format or standard characteristic of resource

Review

Timescale: ☐

time period studied

Time Scale Unspecified